

Earthworms (Oligochaeta: Megadrile)

from the Mahatma Gandhi University campus, Kottayam, Kerala

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Introduction

Earthworms have been referred to an “ecosystem engineers” since they influence the soil and microbial activity (Lavelle, 1988; Pulleman et al., 2005). They are silently improving the physical conditions of soil like drainage, aeration, fertility, nutrient recycling etc. (Julka, 2008). At present around 3500 species are estimated to be present worldwide (Csuzdi, 2012). Earthworm diversity, community structure and distribution patterns across the tropical parts of the world are not well documented in the literature and hence only little is known about the regional taxonomic richness of the earthworms in these regions (Blanchart and Julka, 1997; Suthar, 2011). As far as India is concerned, few reports are available on the diversity and distribution of earthworms (Mohan et al., 2011) and Kerala state is not an exception.

So far, 509 species (including exotic species) of earthworms have been recorded from India (Julka, 2008) and this comes about 11.1% of the total known global earthworm diversity (Tripathi and Bhardwaj, 2004; Verma et al., 2010). Endemism, both at the generic and species level, is very high in India, about 71% of genera and 89% of earthworms species are endemic (Mohan et al., 2011). The Western Ghats and Western coastal plains stand out as the regions with the highest level of earthworm species richness in India (Dash and Saxena, 2012), which is about 53% of the total earthworm species recorded from India (Mohan et al., 2011). Published work on the megadrile oligochaetes of India includes short publications as well as work on comprehensive fauna (Dhiman and Battish, 2006). Taxonomic studies of the earthworms of Kerala started by Alfred G. Bourne (1894) and the first earthworm named from Kerala region was *Drawida nilamburensis* (Bourne, 1894). Later Fedarb (1897), Michaelsen (1909), Aiyer (1929), Gates (1940) described various species from Kerala. Subsequently, Julka and Chandra (1986), Julka (1988), Julka et al. (1997) etc. had contributed to the taxonomical studies of the earthworm fauna of the state. Hence, we are reporting the results on the collection of earthworms from Mahatma Gandhi University campus - Athirampuzha, Kottayam during 2010 to 2014.

Methods

Samplings were mainly done by digging and hand sorting method as proposed by Senapati and Sahu (1993). Soil lumps were broken and the soil was sifted between fingers to sort out the worms. Collected specimens were preserved in 5% formalin. Anatomical details were examined under dissection binocular microscope. Specimens collected were identified and deposited in the earthworm systematic laboratory of the Advanced Centre of Environmental Studies and Sustainable Development, Mahatma Gandhi University, Kottayam.

Results and discussion

Eleven species of earthworms, *Pontoscolex corethrurus* (Muller, 1857), *Drawida ghatensis* Michaelsen, 1910, *Drawida* nr. *travancorensis*, *Ocnerodrilus occidentalis* Eisen, 1878, *Dichogaster bolaui* (Michaelsen, 1891), *Megascolex auriculata* Aiyer, 1929, *Megascolex konkanensis* Fedarb, 1897, *Megascolex cochinensis* Stephenson, 1915, *Megascolex* nr. *polytheca*, *Perionyx excavatus* Perrier, 1872 and *Metaphire houletti* (Perrier, 1872), belonging to five families were recorded from the Mahatma Gandhi University campus. Results suggest that the Megascolecidae family dominate the earthworm fauna of this campus with six species. Among the species recorded *Megascolex auriculata* and *Drawida ghatensis* are endemic to the state. Species such as *Pontoscolex corethrurus*, *Ocnerodrilus occidentalis*, *Dichogaster bolaui* and *Metaphire houletti* are naturalized exotic species of India. *Perionyx excavatus* is a native species of India, but its original home is believed to be the Himalayas (Gates, 1972).

Details of the earthworms collected from the campus

Glossocolecidae

1. *Pontoscolex corethrurus* (Muller, 1857)

Materials examined: 3-4-3. Collection date - 29 November 2010, Collectors - S.P. Narayanan and G. Christopher, Reg. no. ACESSD/EW/1; 3-3-2. Collection date - 18 April 2012, Collectors - S.P. Narayanan and S. Sathrumithra, Reg. no. ACESSD/EW/110; 0-1-3. Collection date - 1 October 2012, Collectors - S.P. Narayanan and S. Sathrumithra, Reg. no. ACESSD/EW/67. Habitat – wide spread in the campus from the well wooded to open areas.

Diagnosis: Dorsal pore absent; Segments – lumbricine at the anterior portion and gradually irregular and becoming quincunx towards the posterior end; clitellum – saddle shapes, xiv, xv-xxii; Tubercula pubertatis longitudinal bands in xviii-xxi.

Distribution: cosmopolitan species (Blakemore, 2003), indigenous to Guyanan Shield region (Righi, 1984) of the Neotropics. This is the most widely distributed peregrine glossocolecid species (Csuzdi and Pavlicek, 2009). Kerala: Dist. Kottayam: Mahatma Gandhi University campus (present record); Dist. Thiruvananthapuram: Bonaccord, Chimunga, Neyyatinkara, Pallode, Trivandrum, Vellany; Dist. Kollam: Shasthancottah; Dist. Alappuzha: Kerumaadi; Dist. Kozhikode: Tiruvellur, Calicut; Dist. Wayanad: Muthanga Wildlife Sanctuary, Wayanad Wildlife Sanctuary (Stephenson, 1923).

Moniligastridae

2. *Drawida ghatensis* Michaelsen, 1910:

Diagnosis: Prostomium prolobic. Dorsal pore absent. Clitellum – x-xiii. Setae – lumbricine. Spermathecal pore paired, large transverse slits in 7/8, at c. Paired tumescences on x and xi slightly anterior and posterior to the male pores. Genital markings absent. Gizzards 5 in xv-xiv. Testis sacs paired. Vas deferens coiled in mass of hairpin loops. Prostates paired, glandular shortly stalked, ovoidal, prostatic capsule oval, erect. Spermathecae paired in viii, adiverticulate, ampulla pear-shaped, duct pierces through the septum 7/8 to enter on the dorsal surface at about centre of the atrium in vii, atrium oval, sessile slightly projecting into viii.

Materials examined: 0-8-2. Collection date - 1 October 2012, Collectors - S.P. Narayanan and S. Sathrumithra, Reg. no. ACCESSD/EW/161; 0-7-2. Collection date - 13 August 2013, Collector - S. Sathrumithra, Reg. no. ACCESSD/EW/157; 0-12-0. Collection date - 26 August 2013, Collector - S. Sathrumithra, Reg. no. ACCESSD/EW/156. Habitat – well wooded areas with decaying leaves and other biomass on the ground.

Distribution: Endemic to Kerala. Kottayam: Mahatma Gandhi University campus (present record), Kottayam; Dist. Thiruvananthapuram: Bonaccord, Mukkunni Reserve Forest, Ponmudi; Dist. Kollam: Kulattupuzha, Maddathoray, Tenmalai; Dist. Pathanamthitta: Thiruvella; Dist. Dist. Palakkad: Road to Valiyaparthodu (Silent Valley National Park) (Stephenson, 1923; Julka and Chandra, 1986).

3. *Drawida* nr. *travancorensis*:

Materials examined: 5-6-2. Collection date - 29 November 2010, Collectors - S.P. Narayanan and G. Christopher. Habitat – Loose soil and well wooded areas with decaying leaves and other biomass on the ground.

Ocnerodrilidae

4. *Ocnerodrilus occidentalis* Eisen, 1878:

Diagnosis: Small earthworm. Genital markings absent. Clitellum – annular. Prostomium – epilobous, tongue usually open but many be closed or even unrecognizable. Spermathecal pores absent.

Materials examined: 0-0-2. Collection date - 26 August 2013, Collector - S.P. Narayanan, S. Sathrumithra and D. Kuriakose, Reg. no. ACCESSD/EW/204. Habitat – kitchen drainage area.

Distribution: cosmopolitan species indigenous to the Neotropics (Blakemore, 2003). Kottayam: Mahatma Gandhi University campus (present record); Dist. Thiruvananthapuram: Nedumangad, Trivandrum; Dist. Alappuzha: Chengannur (Stephenson, 1923; Aiyer, 1929)

Octochaetidae

5. *Dichogaster bolaui* (Michaelsen, 1891):

Diagnosis: Small earthworm. Genital marking – absent. Setae – lumbricine. Prostomium – epilobous. Clitellum – annular but thinner at ventral portion. Dorsal pore – 5/6-6/7. Male pores minute, in seminal grooves on the setal arc of XVIII. Seminal grooves slightly concave between setal arcs of xvii and xix. Gizzards – in vi, vii. Spermathecal duct barrel shaped, and of about the same size as of the ampulla.

Materials examined: 0-0-3. Collection date - 26 August 2013, Collector - S.P. Narayanan, S. Sathrumithra and D. Kuriakose, Reg. no. ACESSD/EW/155. Habitat – kitchen drainage area.

Distribution: cosmopolitan species; indigenous to Africa the frequently introduced peregrine *Dichogaster* species all over the tropics and subtropics (Csuzdi and Pavlicek, 2009). Kottayam: Mahatma Gandhi University campus (present record); Dist. Thiruvananthapuram: Neyattinkara, Trivandrum; Dist. Ernakulam: Ernakulam; Dist. ? : Terkulalai; Dist. Palakkad: Kanjikode (Stephenson, 1923; Kathireswari *et al.*, 2005)

Megascolecidae

6. *Megascolex auriculata* Aiyer, 1929:

Diagnosis: Small earthworm. Prostomium – proepilobous. Dorsal pore – begins at 9/10. Seatal arrangement – lumbricine up to middle portion of the body and then change to perichaetine. Clitellum – annular – xiv-1/2xvii. On the ventral surface of segment xviii are two excavations placed obliquely, separated by an interval equal to aa. Male pores are on segment xviii and female pores are paired. Gizzard – barrel shaped in segment vi. No calciferous glands. Last heart is in segment xiii. The prostates are thick and loosely lobed and extend through three or four segments. Spermathecae are two pairs in segments viii and ix. Ampulla thickly club shaped, duct is very short. Unidiverticulate, cylindrical, arise from the base of the ampulla.

Materials examined: 0-0-3. Collection date - 13 December 2010, Collectors - S.P. Narayanan and K. Rahul, Reg. no. ACESSD/EW/6. Habitat – grass covered portions within the wooded areas.

Distribution: Endemic to Kerala. Dist. Kottayam: Mahatma Gandhi University campus (present record); Dist. Idukki: Kumili, Vandiperiyar (Aiyer, 1929).

7. *Megascolex cochinensis* Stephenson, 1915:

Diagnosis: Medium sized earthworm. Prostomium epilobus. First dorsal pore in 5/6. Setae: - perichaetine. Setae closer set ventrally. Clitellum xiv-2/3xvii. Male pores as oblique wavy slits, the posterior ends of which approach each other. Female pore single. Spermathecal pores in 7/8 and 8/9, in line with *a*. Gizzard large and barrel shaped, in v. Intestine begins in xix. Last heart in xiii. In front of the clitellum nephridia only as tufts by the side of the esophagus, behind clitellum they form a band (but not single line) in the anterior half of each segment. Seminal vesicles moderately large racemose, in xi and xii. Prostates limited to xviii, each a mass of small rounded lobules, duct passing straight inwards. Spermathecal ampulla ovoid, duct as long as ampulla and less than half as wide, Diverticulum arising from ectal end of duct, club shaped, reaching about middle of ampulla. No penial setae.

Materials examined: 0-0-6. Collection date - 17 October 2014, Collectors - I.M. Nair and R. Kabeer, Reg. no. ACCESSD/EW/441. Habitat – beneath decaying leaves on the roadside.

Distribution: Endemic to Kerala. Dist. Kottayam: Mahatma Gandhi University campus (present record); Dist. Thrissur: Forest Tramway (nr Vazhachal) (Stephenson, 1915).

8. *Megascolex konkanensis* Fedarb, 1897:

Diagnosis: Long earthworm. Anterior end blunt. Prostomium epilobous. First dorsal pore in 4/5. Setae: - perichaetine. Clitellum – annular, xiv-xvi or 1/2xviii. Male pores each in special area, which when fully developed is oval. Female pores paired. Spermathecal pores two pairs, in 7/8 and 8/9. Gizzard is large, in vi. No calciferous glands. Intestine begins XVI. Last heart in xiii. Prostates mop like, duct thick and fairly long, muscular and thinner at the ends. Spermathecae with stalked pear shaped main pouch. Diverticulum given off from main pouch where this joins body wall. No penial setae.

Materials examined: 0-5-14. Collection date - 29 November 2010, Collector - S.P. Narayanan and G. Christopher, Reg. no. ACCESSD/EW/396. Habitat – Open ground areas.

Distribution: Wide spread in west coast of India. Kerala: Dist. Kottayam: Mahatma Gandhi University campus (present record), Kottayam; Dist. Thiruvananthapuram: Trivandrum; Dist. Kollam: Kulattupuzha, Madathoray, Quilon, Shasthancottah; Dist. Alappuzha: Kerumaadi; Dist. Ernakulam: Ernakulam; Dist. Palakkad: Chittoor, Palghat; Dist. Malappuram: Tirur; Dist. Kozhikod: Calicut, Tiruvallur (Stephenson, 1923).

9. *Megascolex* nr. *polytheca*:

Materials examined: 0-4-1. Collection date - 26 August 2010, Collectors - S.P. Narayanan, S. Sathrumithra and, Dinu Kuriakose, Habitat –wooded area in the campus.

10. *Perionyx excvatus* Perrier, 1872:

Diagnosis: Small to medium sized. Prostomium epilobic, tongue open. First dorsal pore in region of 2/3-5/6. Setae: - perichaetine. Clitellum annular in xiii-xvii. Male pores on a small papillae in a singl male field, each papilla with 4-9 penisetal follicles contained in a transverse groove. Spermathecal pores paired, near mid-ventral line in 7/8/9. Genital markings absent. Gizzard absent or slightly developed in v. Intestine begins in xv or xvi. Last pair of hearts in xii. Holandric, testes and male funnels free in x and xi, seminal vesicles in xi and xii. Penial setate present. Spermathecae paired, large, in viii and ix, each with intramural senminal chambers near ental end of duct.

Materials examined: 0-0-1. Collection date - 17 October 2014, Collectors - I.M. Nair and R. Kabeer, Reg. no. ACCESSD/EW/442. Habitat – beneath decaying leaves on the roadside.

Distribution: Widely distributed, but restricted to tropical lowlands from Madagascar east to the Hawaiian Islands (Julka and Senapati, 1987). Kerala: Dist. Kottayam: Mahatma Gandhi University campus (present

record); Dist. Thiruvananthapuram: Thiruvananthapuram, Vellayambalam; Dist. Thrissur: Trichur; Dist. Kozhikod: Chevagun near Calicut (Stephenson, 1923; Nair *et al.*, 2007). India: Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Maharashtra, Odisha, Tamil Nadu, Uttar Pradesh, West Bengal (Julka and Senapati, 1987; Kathireswari *et al.*, 2005; Siddaraju *et al.*, 2010).

11. *Metaphire houletti* (Perrier, 1872):

Diagnosis: Perichaetine setae arrangement; clitellum annular, at segments xiv-xvi; male pores in copulatory pouches, on segment xviii; spermathecal pores 3 pairs, at intersegmental furrows 6/7-8/9; intestinal caeca, simple, in xxvii-xii; typhlosole present; prostates racemose, in xvi-xxii; holandric; testis sacs unpaired, ventral; seminal vesicles, in xi, xii. Pseudovesicles, in xiii, xiv, quite rudimentary; spermathecae, duct ectal to diverticular junction with narrow lumen that opens into parietal invaginations without externally recognizable demarcation from the duct itself, diverticulum with short, slender stalk and wider, elongate seminal chamber that is variously looped.

Materials examined: 0-2-4. Collection date - 26 August 2013, Collector - S. Sathrumithra, Reg. no. ACESSD/EW/148. Habitat – well wooded areas.

Distribution: Wide spread peregrine species (Gates, 1972). Dist. Kottayam: Mahatma Gandhi University campus (present record); Dist. Thiruvananthapuram: Thiruvananthapuram; Dist. Thrissur: Trichur; Dist. Kozhikod: Chevagun near Calicut (Stephenson, 1923)

Pontoscolex corethrurus, *Ocnerodrilus occidentalis*, *Dichogaster bolau*i, *Megascolex auriculata*, *Megascolex cochinchensis*, *Perionyx excavatus* and *Metaphire houletti* are new record for Kottayam district. So far, species such as *Drawida ghatensis* Michaelson, 1910, *Drawida travancorensis* Michaelson, 1910, *Argilophilus variabilis* (Aiyer, 1929), *Megascolex konkanensis* Fedarb, 1897 have only been reported from Kottayam district. Among the newly recorded species *Megascolex auriculata* is worth mentioning as this species was first described by Aiyer (1929) based on the samples collected from Vandiperiyar and Kumili in 1926. After that, this species has not been collected from any other parts of the state. Hence the present record from the Mahatma Gandhi University campus can be considered as the rediscovery of this species after a gap of 81 years.

Conclusion

Much of the native vegetation of the campus is being converted for developmental activities, but the campus still holds a good diversity of earthworm species. The species diversity in the campus noted in this study is much greater than the earlier reports from the whole district. Hence, we assume that further surveys may add more species to the list of earthworm fauna of the campus as well as from the Kottayam district.

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Heronry Census, 2014 in Kannur district, Kerala

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Abstract

A survey of the heronries in Kannur District, Kerala was carried out from 25July, to 3August 2014. A total of 25 heronries consisting of 1416 nests of eight species of colonial nesters Little Cormorant *Phalacrocorax niger*, Indian Cormorant *Phalacrocorax fuscicollis*, Oriental Darter *Anhinga melanogaster*, Indian Pond Heorn *Ardeola grayii*, Black-crowned Night Heron *Nycticorax nycticorax*, Little Egret *Egretta garzetta*, Median Egret *Egretta intermedia* and Grey Heron *Ardea cinerea* were recorded. There was 18% decline in the overall number of nests when compared to the year 2013 in the district. Anthropogenic disturbances such as cutting down of nesting trees and branches, hunting, disturbing nesting by bursting crackers etc. are the main threats faced by these birds.

Introduction

The term “heronry” can be considered as group nesting of colonial water birds of the orders Ciconiformes, Pelecaniformes and Suliformes which comprise of herons, egrets, storks, pelicans, ibis, darter and cormorants during the breeding period, which shows spatial and temporal clumping of nests. The previous survey of the heronries in Kannur district was done in the year 2013 (Roshnath *et al.*, 2013).